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NOTES ON CESTODES AND TREMATODES OF MARINE FISHES OF SOUTHERN CALIFORNIA

BY

GEORGE F. SLEGGS

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INTRODUCTION

The following paper is based upon the collection of fish parasites in the Scripps Institution, made partly by Professor W. E. Allen at Pacific Grove, California, in 1909, and later augmented at various dates by entozoa collected by Mr. P. S. Barnhart at La Jolla.

Although the collection was not very large it has served to provide evidence of new hosts and of a wider geographical distribution of parasites which have been previously described from other regions of the world. In addition it has made possible the description of the external characters of several new forms. The subject of fish parasites of the coastal region of southern California has not received much attention, and it is therefore not surprising that material collected here appears to be so largely composed of new forms. The time at my disposal for this work did not permit of the extensive task of describing the internal anatomy of the species I am designating as new. The paper is to be regarded as only a preliminary survey of the undoubtedly valuable material to which I have had access.

LIST OF SPECIES DESCRIBED

Species	Host	Locality
Dibothrium sagitticeps n. sp.	*Sebastodes* sp.	Monterey
	Ophiodon sp.	Monterey
Dibothrium occidentale Linton	*Sebastodes* sp.	La Jolla
Oncobothrium pinguicollum n. sp.	Skate	Monterey
Tetrarhynchus bisulcatus Linton	*Lamna cornubica*	La Jolla
Distomum veliporum Creplin	*Raja bituberculata*	La Jolla
Distomum appendiculatum Rudolphi	*Paralichthys californicus*	Monterey

DESCRIPTIONS OF SPECIES

Dibothrium sagitticeps n. sp.

Figures 1–5

Two bottles of material, one from *Sebastodes* sp. and one from *Ophiodon* sp., all collected by Professor Allen at Monterey Bay, yielded about a score of specimens belonging to the genus *Dibothrium* Diesing, 1850. Although slight differences exist in size and habit of body, both lots appear to comprise one species of tapeworm which I propose to term *D. sagitticeps.* The specimens appear to be related to two previously described forms, namely, *D. microcephalum* Diesing, 1850, and *D. aluterae* Linton, 1887. These two species are themselves very closely related: in establishing the species *D. aluterae,* from *Alutera schoepfi,* Linton refers to the resemblance of that cestode to *D. microcephalum.* He states, however, that he did not observe any indication of the hooks on the head mentioned by Wagener for *D. microcephalum,* but at the same time he considers the identity of *D. aluterae* and *D. microcephalum* probable. On finding that my material resembled *D. aluterae* I therefore made a comparison with *D. microcephalum* as well. The hooks are carefully figured by Wagener, and they are so conspicuous that there could be no possibility of identity, since no hooks whatever are present on my material. The differences from *D. microcephalum,* also, in size, external anatomy, and host justify the assignment of the worm to a new species.

Description.—The scolex is small, bluntly sagittate in marginal view (figs. 1, 4), the posterior portions of the bothria diverging and overlapping the first two or three segments. The bothria are lateral, of an elongated ovate shape, broader at the anterior end and tapering slightly posteriorly (fig. 3). Their edges are often slightly thinned and puckered. In the specimen from which figure 3 was drawn the cavity of the bothrium had four or five transverse elevations which divided it into several shallow depressions. The posterior edge of the bothrium has a regularly curved outline, and is not indented as described by Linton for *D. aluterae.* No hooks are present upon the head. The head is slightly constricted at the level of the anterior edge of the bothria, forming a blunt, button-shaped apex. This terminal portion in front view exhibits an oblong form with rounded corners, being about one and a half times as long (from margin to margin) as broad (from bothrium to bothrium) (fig. 5). Linton states that the knob was nearly circular in *D. aluterae,* measurements showing that the lateral diameter was little more than the marginal. Measurements upon *D. sagitticeps* n. sp. showed that the marginal diameter exceeded the lateral by some 60 per cent, the tendency to elongation being thus in a direction at right angles to

that in *D. aluterae*. *Dimensions:* Length of head, 0.85 mm.; width, 0.55 mm. Measurements of button at apex of scolex: Length, 460μ, breadth, 280μ, approximate averages. The surface of the knob is bisected by a prominent furrow running from the midpoint of the anterior edge of each bothrium; the furrow does not continue over

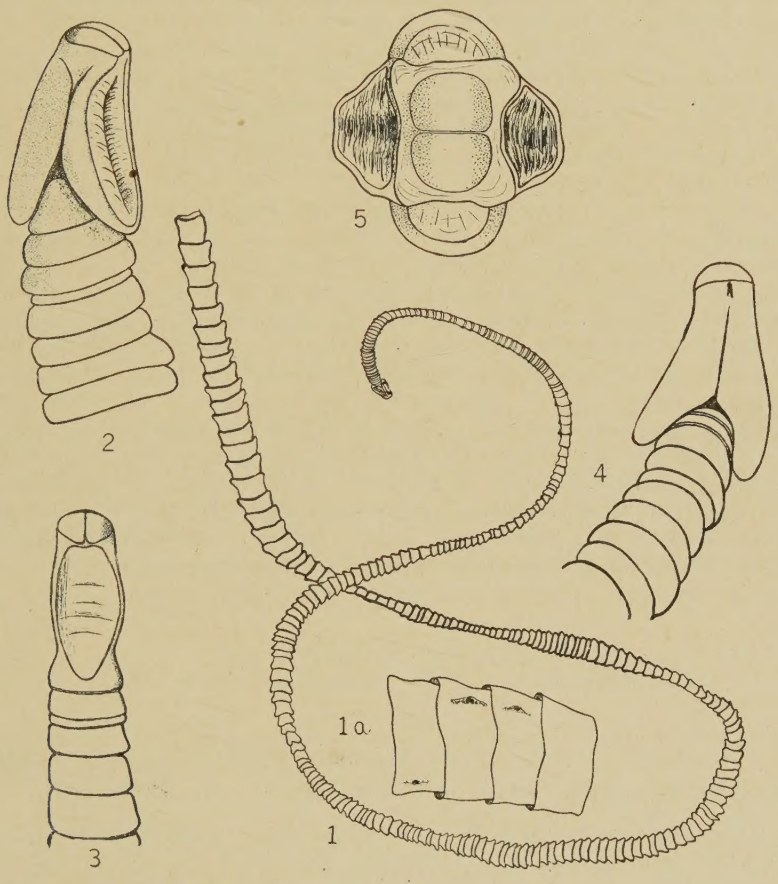


Fig. 1. *Dibothrium sagitticeps* n. sp. × *ca.* 3.

Fig. 1*a*. Enlarged view of a portion of the strobila showing genital apertures.

Fig. 2. *Idem.* Scolex magnified, viewed obliquely to show one of the bothria.

Fig. 3. *Idem.* Scolex in lateral view. Young specimen.

Fig. 4. *Idem.* Scolex in marginal view.

Fig. 5. *Idem.* Scolex in anterior aspect. The cavities of the bothria (shaded dark) are seen right and left, the first two segments above and below.

the edge of the bothrium, i.e., into its cavity. The knob in the preserved specimens was markedly whiter and of denser material than the rest of the head, and the furrow gives it a double appearance.

Since the head, particularly the most anterior portion, is so uniform both in shape and size I have figured it in anterior view under the high power of the binoculars (fig. 5). In an apparently young

specimen (as judged by the length of the strobila) the head in lateral view was approximately the same width as the most anterior segments (fig. 3); in older specimens the head in lateral view is markedly narrower than the first segment. There is no neck, segmentation beginning at once. The segments are usually four or five times as broad as long, frequently alternating in the matter of length, a very short segment being interposed between two of normal length (figs. 1, 2, 3). The tendency to alternation of length in the segments is irregular: sometimes the alternately long and short segments follow one another over a considerable stretch of the strobila, with intervening stretches consisting of segments of normal length. In other cases an occasional short segment may be interpolated in any portion of the strobila.

The body in the region following the head is linear, and somewhat roundish in cross-section. The segments possess thick overlapping posterior edges. Farther back their edges are thinner and overlap to a greater extent, making the segments funnel-shaped posteriorly (fig. 1*a*). Owing to the fact that the specimens were not examined in the fresh condition and therefore some of them may have been broken in preservation, it is impossible to state definitely the average length of the animal: I estimate it to be 25–30 cm. The median and posterior segments are not densely crowded as described by Linton for *D. aluterae* (in which they are ten times as broad as long). The genital apertures occur on both faces of the strobila; very often a succession of three or four proglottides has the aperture dorsally situated, and a series following has it ventral. The aperture may be in the middle of the segment or displaced some distance toward the margin (fig. 1*a*), either to the right or left of the midline.

Dibothrium sp., cf. **D. occidentale** Linton, 1897

Figures 6, 7

This species, of which there were two individuals in the collection, was taken from the stomach of *Sebastodes*[1] sp., the Rock Cod.

Description.—In size the specimens more nearly resembled *D. infundibuliforme* (Rudolphi) Diesing, 1850, than any other form, but they are definitely removed from that species by not exhibiting a small triangular prolongation upon the extremity of the head (Ariola, p. 434). In other respects the present form appears to be most nearly identical with *D. occidentale* Linton, 1897. Linton, in founding the latter species upon specimens from *Sebastodes* sp., refers to the resemblance of his material to *Bothriocephalus angusticeps* Olsson, 1892. My material was therefore compared with the description of *B. angusticeps* given in Ariola's revision of the *Bothriocephalidae*. In the latter species the bothria are stated to be marginal but in my material they are lateral, which renders an identification with *B. angusticeps* out of the question. Comparisons with other species which possess an oblong scolex, such as *Bothriocephalus labracis*

[1] The specific identity of the host was not recorded; hence it is referred to as *Sebastodes* sp.

Dujardin, 1845, *B. punctatus* Rudolphi, 1808, and *Dibothrium manubriforme* Linton, 1889, were rendered nugatory by disparities in size and in details of anatomy.

In the absence of evidence from the internal anatomy I do not propose to create a new species, but to compare the specimens with *D. occidentale.* Linton, in figuring the head of *D. occidentale,* does

6

7

Fig. 6. *D. occidentale* Linton. Scolex in oblique view. The face of the bothrium is downward.

Fig. 7. *Idem.* Scolex in lateral view.

not indicate a division of the apex by a furrow running from margin to margin (fig. 6). Otherwise the resemblance is fairly close and the host the same. *Dimensions:* Length of head, 0.85 mm.; breadth of head, 0.30 mm. These measurements are slightly smaller than those given by Linton.

The material was collected by P. S. Barnhart at La Jolla.

Oncobothrium pinguicollum n. sp.

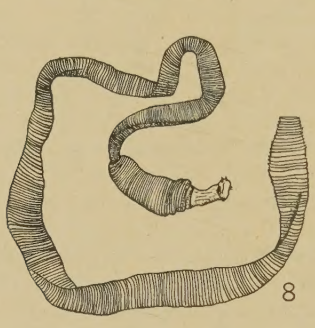
Figures 8, 9, 10, 11

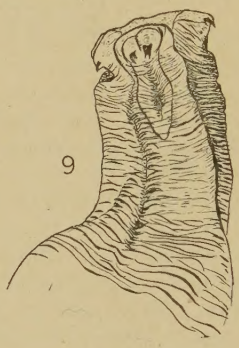
About half a dozen specimens of this parasite were collected from a skate (species not stated) at Monterey.

Description.—The identification of this form with any previously described species has proved a matter of considerable difficulty. The bothria are four in number and bear each a pair of hooks (fig. 9). The presence of the hooks assigns the form to the subfamily Phyllacanthinae van Bened. (of the family Tetrabothridae Dies.). The absence of auxiliary acetabula does not permit of inclusion in the genera *Calliobothrium* van Bened., or *Phoreiobothrium* Lint. The form would appear to be near to *Onchobothrium* Blv. But the bothria are not divided into three by transverse ridges, as in *Onchobothrium uncinatum* Diesing, nor do the posterior edges project out some distance from the neck, giving the head a markedly sagittate appearance as figured by both Linton and Zschokke. Further, the bothria are small and widely separated on the head, not contiguous as in *O. uncinatum.*

Since *O. uncinatum* appeared at first to be the most likely identification the following comparison will be given. In *O. uncinatum,* according to Zschokke, the following measurements obtain: Length

of bothrium, 0.5 mm. to 0.6 mm.; width of head, 0.30 mm. to 0.60 mm. In *Oncobothrium pinguicollum* n. sp. the corresponding measurements were: Length of bothrium, 0.21 mm.; width of head, 0.50 mm. It will be seen that the suckers were markedly smaller in proportion to the breadth of head. But perhaps the most important feature of *O. pinguicollum* is the possession of a well developed pseudoscolex. When the specimens were collected it had evidently been impossible to detach them from the wall of the gut, which was accordingly removed together with the imbedded parasite to avoid destroying the latter. It was thus necessary to dissect away the adhering gut tissue before the head could be figured. The anterior portion of the strobila was





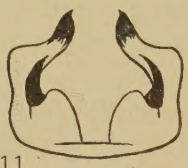


Fig. 8. *Oncobothrium pinguicollum* n. sp. View of entire worm, × *ca.* 5. The pseudoscolex is shown, surmounted by the somewhat distorted scolex.

Fig. 9. *Idem.* Scolex, magnified, of a dried specimen. Below can be seen the beginning of the pseudoscolex.

Fig. 10. *Idem.* Head in anterior aspect.

Fig. 11. *Idem.* Hooks magnified.

then seen to be greatly distended, the distension beginning just behind the scolex proper and extending back for several millimeters. The distended region is very sharply limited both anteriorly and posteriorly. It forms, together with the scolex which surmounts it, an important organ of attachment since the pseudoscolex communicates by a relatively narrow neck with the rest of the strobila through a small aperture in the epithelium of the gut, the imbedded portion swelling out considerably within the tissues of the gut wall. The enlarged region consists of numerous incipient segments, usually about ten times as wide as long. In its middle and thickest portion the width is from 1 to 2 mm. The enlarged region may be straight or curved; it may be flattened or circular in cross-section; it may

be of more or less uniform thickness along its whole length or thickest in one place and tapering toward the two circles of delimitation. The enlarged region is thus considerably larger than the scolex itself. The scolex bears four small bothria each provided with a pair of hooks (fig. 11). In most of the specimens examined the scolex was highly distorted as shown in figure 8. In two specimens it was undistorted (fig. 9), allowing the bothria to be studied. In anterior view the scolex presents the appearance shown in figure 10, the chitinous bases of the hooks and their attached muscles showing darkly through the integument as four crescentic patches. The scolex does not bear a group of three suckers above each of the bothria as described by Scott for *Acanthobothrium coronatum* van Bened., nor does it bear any accessory acetabula. Diesing in 1863 placed in the genus *Calliobothrium* the species of the genus *Onchobothrium* which possessed four accessory suckers on the summit of the scolex. He divided the Tetrabothridaea into two groups, the first having no accessory suckers and including *Onchobothrium,* the second having accessory suckers and including *Calliobothrium.* The possession of a pseudoscolex is not reported anywhere for *Onchobothrium uncinatum;* hence, on account of this and of the other differences recorded above, the name *O. pinguicollum* (stout neck), having reference to the superficial appearance of the parasite, is proposed for a new species.

Tetrarhynchus bisulcatus Linton

This parasite was collected from the shark *Lamna cornubica.* Linton has recorded it from the Atlantic coast in *Carcarhinus obscurus.*

Distomum veliporum Creplin

Figures 12, 13

In the material collected by Barnhart was a bottle containing some twenty specimens of an elongated subcylindrical trematode from the stomach of *Raja bituberculata,* which I am provisionally assigning to *Distomum veliporum* Creplin, though it resembles also *D. cestoides* as figured by Scott. I have as yet been unable to find a statement of the differences between *D. veliporum* and *D. cestoides.* Scott himself, while referring to *D. veliporum,* does not discuss his reasons for assigning his own material to *D. cestoides* in preference to *D. veliporum.*

Description.—Making a comparison on the basis of dimensions it is seen that the Scripps Institution specimens agree in the matter of width more closely with *D. veliporum* than with *D. cestoides.* The specimens were fairly uniform in length, about 7 cm.; the greatest width was about 3.5 mm. at a point about 3 cm. from the anterior end. The body was slightly flattened, with numerous transverse creases in the integument; posteriorly it tapers gradually. The

anterior sucker is subterminal, facing downward and forward at an angle of about 45 degrees to the portion of the body between the two suckers. In the preserved specimen it possesses smooth incurved edges. Its aperture is round, about 0.75 mm. in diameter. The posterior sucker is situated about 8 mm. behind the anterior sucker. Its aperture is considerably wider, and faces ventrally, at right angles to the portion of the body between the suckers. The aperture

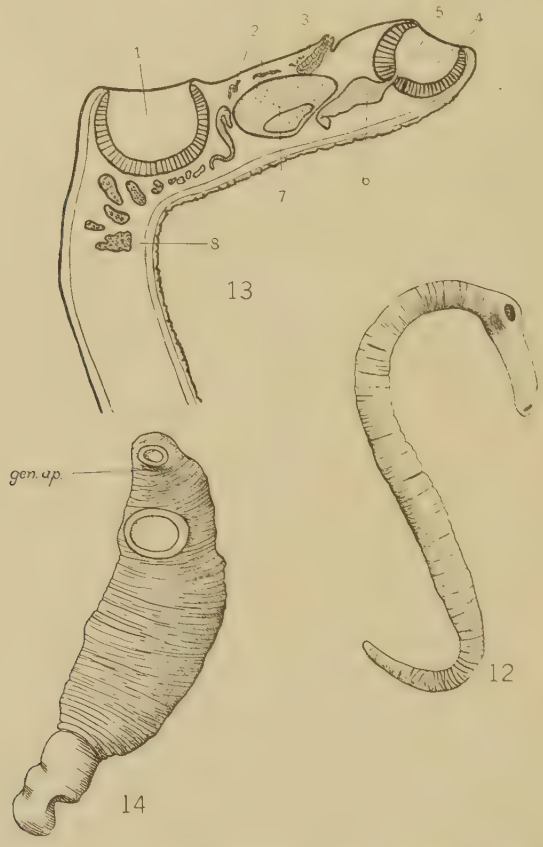


Fig. 12. *Distomum veliporum* Creplin. Whole worm, × *ca.* 3½.

Fig. 13. *Idem.* Median sagittal section through anterior region. *1*, posterior sucker; *2*, ovary; *3*, penis; *4*, anterior sucker; *5*, mouth; *6*, pharynx; *7*, vesicula seminalis; *8*, portion of uterus.

Fig. 14. *Distomum appendiculatum* Rudolphi. Whole Worm, × *ca.* 35. *gen. ap.*, genital aperture.

is elliptical, exceeding considerably that of the anterior sucker, the major axis of the ellipse being longitudinal. Like the anterior sucker it exhibits incurved edges. The body is markedly thickened and bulbous in the region of the posterior sucker. The anterior portion of the body, that is to say the portion of the body including the suckers, was straight and turgid, of a firmer consistency than the remainder of the body, to which it was inclined at an angle of between

30 and 40 degrees, giving the worm the characteristic habit of body.

The genital aperture is roundish, with puckered edges, and is situated from one-third to one-fourth of the distance from the anterior to the posterior sucker. When the worm is bisected by a median sagittal section (fig. 13) the cup-like suckers are displayed. It is to be observed that the anterior sucker has a slightly thicker wall than the posterior. The cavity of the anterior sucker is about 1 mm. in diameter, that of the posterior sucker about 2 mm. The mouth opens into the posterior portion of the wall of the anterior sucker. The reproductive canal and its opening are directed markedly forward. The region of the body for some distance behind the posterior sucker is filled with the folds of the uterus, containing the dark brown eggs.

Distomum appendiculatum Rudolphi

Figure 14

About ten specimens, fairly uniform in size (about 4 mm. long), were taken from the Monterey Halibut, *Paralichthys californicus.* They are to be assigned to the species *D. appendiculatum* Rud. This species has been recorded by Linton from *Paralichthys dentatus* in the Wood's Hole region. The following description is based upon that given by Linton.

Description.—Body cylindrical, crossed by transverse furrows. The material, which had been allowed to dry, was not in a sufficiently good state of preservation to make it possible to recognize the very fine transverse striae referred to by Linton. The neck is markedly concave beneath. The posterior sucker is about twice the diameter of the anterior. The reproductive aperture is situated ventrally, just behind the anterior sucker. The tail-like appendix was in various degrees of retraction among the different specimens. Figure 14 is of a specimen which exhibited the appendix in a good condition.

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